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The population of the Caucasus, which in 1858 was only 4,526,000, had in 1880 risen to 5,870,000, the immigration of Cossacks and Russian peasants more than counterbalancing the emigration, while all districts have a regular excess of births over deaths. The Russian element is now in excess of any other, consisting of 1,410,000, while the Georgians are but 1,150,000 in number, and the Lesghiens and mountaineers have diminished since 1858 from 1,400,000 to 1,050,000.

Lukoma, the principal island in Lake Nyassa, though only four and a half miles long and two and a half wide, contains 2,500 inhabitants. Ula, or witchcraft, of the kind described with much graphic force by Mr. Rider Haggard in one of his earlier works, prevails and is a great curse in the island.

Herr Aug. Fitzau (*Deutsche Geographische Blatter*) gives an account of the West African seaboard between Morocco and the Senegal. Though Arabic is the prevalent language, he believes that the old Hamitic or Berber is still the chief ethnic element. The writer describes in detail the coast between Agadir and St. Louis.

Count Teleki has ascended Mt. Kenia to a height of 15,000 feet, and believes its elevation to be greater than that of Kilima-njaro. Corrections made by Dr. H. Heyer himself in the barometrical observations taken during his ascent of Kilima-njaro prove that he did not reach within 820 feet of the summit of the mountain.

Petermann's *Mitteilungen* (Part 5) gives an account of a partial exploration of the small and little-known group of the Nanusa Islands, seven in number, and situated in 4.35 N. Lat., and 127.5 E. Long. Only three of the islets—Karaton, Mengampit, and Onrata—are inhabited, and the total population is about 1,000. All the islands are girt by reefs, and the only good anchorage is on the east side of Karaton. Mengampit has a hill, 800 feet high, in its centre, and is well wooded, but Karaton is flat.

GEOLOGY AND PALÆONTOLOGY.

THE EXTINCT SCLERODERMS.—By reason of the deviation from copy of the note on "Some Extinct Scleroderms" in the AMERICAN NATURALIST for May, 1888, p. 448, it might be inferred that there were more extinct genera of Balistids than are really known. The genera are (1) *Balistomorphus* Gill (=*Acanthoderma* Ag. 1843, not Cantraine 1835) and (2) *Bucklandium* Koenig (=*Glyptocephalus* Ag. 1843, *fide* Pictet, not Gottsche 1835).

The part of Professor Zittel's valuable "Handbuch der Palæontologie" (III. Band, 2. Lief.) describing the Teleost fishes, has recently appeared. The correlation between the morphology and systematic relations of existing and extinct fishes has been obscured and sometimes contradicted by the adoption of the very misleading and unscientific classification of Günther. The anachronistic idea that there is near relationship between Plectognath and Ganoid, fishes is consequently likewise still adhered to.[1] This idea has been so thoroughly exploded by several writers and its fundamental error is so obvious to any one who considers the evidence and compares the structural characteristics of the various types, that surprise must be felt that so intelligent a palæontologist as Professor Zittel clings to it. There can be little, if any, doubt to any competent observer who compares the skeletons and other parts of Scleroderm fishes with the Teuthidids and Siganids that the views of Dareste, Cope and others are correct, that the Scleroderms have originated from the same stock as the Teuthidids, and that consequently they are removed further than most fishes, and further even than the related Teuthidoidea, from the Ganoids. The genus *Protobalistum* is adopted by Professor Zittel with the expanded limits recently assigned to it by Baron de Zigno. To those who adopt Dr. Günther's views of the classificatory value of characters, the demonstration of the erroneous association of the forms embraced under the genus is easy. The relative size of the spinous and soft portions of the dorsal furniture are regarded by Dr. Günther as of *more than family* value, as in the case of his *Acanthopterygii perciformes, A. cotto-scombriformes, and A. blenniiformes.* Now, just such differences as have been used to separate those groups are found between the two fishes referred to the genus *Protobalistum* by Baron de Zigno and Professor Zittel. The *P. imperiale* has the spinous dorsal *much longer* than the soft, while the *P. Omboni* has the spinous dorsal *much shorter* than the soft. Therefore the differentiation of the two species not only generically but as family types follows. It is not even certain that the typical *Protobalistum* is a true Scleroderm.

The diagnostic characters of the several families of Scleroderms are as follows :—

PROTOBALISTIDÆ.—Sclerodermes[2] with the spinous dorsal very elongated and composed mostly of long spines separated by considerable intervals, the soft dorsal short, and with ventrals atrophied or represented by weak spines.[1]

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[1] "Diese......Fische zeichnen sich besonders durch ihre eigenthümliche, bald aus harten rhomboidischen Schuppen, bald aus knöchernen Schildern, Stacheln oder Platten bestehende Hautbedeckung, sowie durch die innige Verwachsung der meisten Kopfknochen aus. Agassiz rechnete sie noch zu den Ganoiden, mit denen sie in der That mancherlei Uebereinstimmung aufweisen." Zittel, op. cit., p. 257.

[2] It is possible that the Protobalistids may prove to be not Scleroderms but Acanthopterygians.

TRIACANTHIDÆ.—Sclerodermis with the spinous dorsal very short and composed of a stout anterior spine and several approximated weak ones behind it, the soft dorsal oblong, and with ventrals represented by stout spines, and with or without weak axillar rays.

BALISTIDÆ.—Sclerodermis with the spinous dorsal very short, being represented (1) by a stout spine with which a weaker posterior spine interlocks in erection (and often a third spine exists), or (2) by only a single slender spine; the soft dorsal long or oblong, and the ventrals wanting.

These characters are supplemented by important osteological ones for the last two at least.

The family Triacanthidæ was represented in the eocene seas of Europe by the genera *Acanthopleurus* (Ag.) and *Protacanthodes* (Gill). The affinity of the former to *Triacanthus* was remarked as long ago as 1859 by von Rath (*Zeitschr. deutsch. Geol. Ges.*, V. ii., pp. 130–132).

Other genera referred to the sub-order of Sclerodermis (*e.g.*, *Blochius*, *Dercetis*, *Styracodus*, *Chilodus*, *Cœlorhynchus*, *Ancistrodon*) are quite remote from it.—*Theo. Gill.*

SECOND NOTE UPON ROMANOVSKY'S MATERIALEN ZUR GEOLOGIE VON TURKESTAN.—In the Tertiary, as in the Cretaceous, the absence of fossils renders it almost impossible to mark off stages, and even precludes the exact determination of the base of the group. It would appear that the continuity is complete, and that Eocene, Oligocene, Miocene, and Pliocene are all represented. The Nummilitic has been met with only upon the borders of the Aral Sea, where it is overlaid by the sandstones, clays, and limestones belonging to the Oligocene, which are surmounted by the Miocene limestones, and by the argillaceous beds of the Sarmatic stage; these last form the upper layer of the plateau of Ust-Urt. Conglomerates, which form heavy beds in the mountains, are gradually replaced by rocks of finer grain as the distance from their feet increases. The Cretaceous strata of Turkestan contain important beds of phosphorite (mouth of the Syr-Daria), of gypsum (Tian-shan, Pamir), petroleum (Fergana), and sulphur (basin of the Amou-Daria); and the Tertiary has intercalations of salt and gypsum (Sangar, Samarcand), the thickness of which diminishes gradually towards the west.

The history of Turan during the recent geological periods has many features in common with that of the rest of Central Asia, and especially with that of Afghanistan. After the continental phase of the Jurassic, came the marine invasion corresponding to the deposition of the Cretaceous beds; sedimentation then continued quietly and tranquilly during the Tertiary period, at the bottom of a sea at first open to a large extent and communicating freely with the ocean, but the area of which was always diminishing, until in the Sarmatian epoch this Mediterranean became closed, and was gradually converted by evaporation into distinct sheets of water, the remnants of which still remain and diminish under our own observation. During these ages the great mountain border of the East gained in height and in development. The Pliocene is at its summit intimately connected with the Aralo-Caspian deposits, which are chiefly composed of the debris of the Cretaceous and Tertiary strata, the slight cohesion of the older deposits facilitating greatly the disintegration effected by atmospheric agencies. The Aralo-Caspian fossils belong to species that now inhabit the Caspian and Aral Seas, and their nature and mode of distribution is such that, taken in conjunction with what is known of the existing Caspian fauna, it is possible to ascertain the exact circumstances in which the sediments were laid down; since all the species except *Cardium edule* and *Lithoglyphus caspius* live near the coast, at depths never exceeding fifteen metres. The Aralo-Caspian Sea consisted of two immense basins, the western corresponding to the Caspian, though immensely more extensive than its existing shrunken remainder; while the eastern comprised the Aral, but extended far beyond it (according to Ssevertsoff it reached Lake Balkash). The western sea was much the larger and more profound, and the eastern was strewn with scattered islands. Between these basins the plateau of Ust-Urt formed a long peninsula, and the basins communicated by a sinuous strait passing through Lake Sarykamish. The part of this strait leading from the Caspian to Sarykamish is the present Usboi, and, though considered by Grimm as an ancient bed of the Oxus or Amou-Daria, can never have been such, as its bed contains no traces of alluvium, but consists of Aralo-Caspian deposits. The facts indicate that in the Aralo-Caspian epoch the Oxus, taking in the Khiva region the course of the present Urun-Daria, fed Lake Sarykamish, which rapidly dried up when the river turned aside to the benefit of the Aral. The winds from the north and northeast have transformed into deserts the dry beds of the ancient lakes, and have formed those long ranges of dunes called *Barkhans* that cover such vast spaces throughout Turkestan.

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[1] See de Zigno, p. 4; Am. Nat., 1888, p. 447, note.

RÜTIMEYER ON THE CLASSIFICATION OF MAMMALIA, AND ON AMERICAN TYPES RECENTLY FOUND IN SWITZERLAND.[1]—

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[1] Ueber einige Beziehungen zwischen den Saügethierstämmen alter u. neuer Welt. Erster Nachtrag zu der Eocenen Fauna der Egerkingen; von L. Rütimeyer; Zurich, 1888. Abhandl d. Schwiez. Palæontol. Gesselsch. Bd. XV.

This important memoir is divided into two portions as indicated in the above title. I refer to the second part first in order, by recording the discoveries it announces. Prof. Rütimeyer has made the highly interesting discovery of a species of Phenacodus at Egerkingen, which he names *P. europœus.* He also refers species from the same locality to the genera Protogonia, (?) Mioclænus, and (?) Pelycodus, and to the new genus Meniscodon. Unfortunately all of these species are known from the teeth only, so that the references are not yet final. He also gives descriptions of new specimens of *Cœnopithecus lemuroides* Rütim. and *Proviverra typica* Rütim.

In the first part of the memoir, Prof. Rütimeyer discusses the relations of the various members of the Ungulata, with reference to their classification. This consists chiefly of a criticism of the system proposed by Cope, and the results he reaches are expressed as follows: (p. 62).

First.—That the categories of Ungulata, based by Cope on the nature of the mutual carpal and tarsal articulations, do not furnish exact definitions for systematic use. Although they furnish instructive series of modifications of the mechanism of motion, they do not offer sharp lines of distinction. Especially can the so-called condylarthrie have a very relative value, and between it and the diplarthrie is there no sharp line.

Second.—The plan of structure which characterizes the superior molars of the Condylarthra consists in a disposition of the tubercles, to which he applies the name trigonodontie, since there are three principal tubercles arranged *en triangle,* two external and one internal, so that the cross-valley of the crown is closed within. It is this type of dentition which is common among lemurs and Insectivora, and which prevails among Carnivora. It is thus probable that trigonodontie is to be regarded as an earlier and more primitive form of molar than those of the zygodont (quadritubercular) type. The selenodont type appears to have arisen from trigonodont ancestors.

Third.—The trigonodont structure of superior molars as is present in the Condylarthra is by no means confined to American Ungulata, but is found in Europe even to generic details; so that it is probable that the foot-structure of the Condylarthra will be also found in Europe.

Fourth.—It is therefore not necessary to look to America alone for the first known ancestors of the horse.

Fifth.—Except the Dinocerata, which, like the Toxodontia, has a limited range in America, the types of Mammalia have developed in such complete parallelism that we are compelled to look to a common and extensive geographical source for them.

Sixth.—Among the false-lemurs, the Cænopithecus of Egerkingen appears to be as nearly allied to the North American Mesodonta as to the European Adapis.

I propose to offer some observations on these propositions, especially to the first and second. The third, and those following, relating as they do to the important discoveries of Prof. Rütimeyer at Egerkingen, constitute valuable additions to the sciences of palæontology and mammalian phylogeny.

The first proposition, that the characters of the carpus and tarsus on which I have relied for discrimination of the orders of Ungulata are insufficient for that purpose, is probably so far true, as a similar assertion made with regard to all structural characters whatever would be. With the discovery of new forms, and the completion of phylogenetic lines, the sharp demarcations we now employ as definitions will vanish. But I claim with regard to the case of the Condylarthra, *that such discoveries have not been yet made*, and that Prof. Rütimeyer's views on this point have been reached by reason of several misconceptions on his part. The supposition that the tarsus of Phenacodus (p. 14) resembles in any degree that of the rhinoceros and tapir, is an unaccountable error. Also (l. c.) the supposition that the carpus of those animals does not represent the diplarthrous type is an equally extraordinary misconception. So is (p. 15) the opinion that such small contact of the astragalus with the cuboid bone as exists in Phenacodus and Hyrax is diplarthrism comparable to that of *Hyracotherium venticolum.*

But supposing Prof. Rütimeyer's view that the carpus of Phenacodus is proboscidian, and the tarsus rhinocerotic, to be correct, an order distinct from Proboscidia and Perissodactyla would be indicated.

The fact is that Prof. Rütimeyer, probably from want of specimens of Condylarthra, has not fully grasped the meaning of the taxeopod, and especially the Condylarthrous type of carpus and tarsus. That type is the unguiculate and carnivorous, accompanying hoof-shaped ungues, and as yet *no transitions* to the usual ungulate type have been found *within the Ungulata*, except in the carpus of the Anthropomorpha (and the result is not typically ungulate). The Condylarthrous carpus and tarsus are also *lemurine,* and are well distinguished from other ungulate types. The structure of the astragalus of Dissacus among the Unguiculates shows us what the transition will be like when it is found.[1]

The second proposition ascribes what Prof. Rütimeyer calls trigonodontie as a definitive and general character of the Condylarthra. I must here record an objection to the introduction of the word trigonodont. It is proposed to replace the term tritubercular among the Ungulata, so that the latter phrase shall apply only to the Unguiculata. But there is absolutely no difference between this type of tooth in the two divisions of Mammalia, and by introducing a new word we obscure this important identity, as well as encumber our memory and literature. The introduction of unnecessary terms has been long a vice in science, but it is now reaching such proportions that specialists must agree to protest against it. Tritubercular and trituberculy or trituberculie are certainly sufficient for all practical purposes.

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[1] **Transactions Amer. Philosophical Society, 1888, pp. 343–4.**

As regards the use of this character as definitive of the Condylarthra, there is no doubt of its prevalence, and that traces of it can be found in the quadritubercular molars of many Phenacodontidæ. It is hard, however, to see it in *Protogonia puercensis,*[3] and is so little pronounced in various species as to make it, like many other characters that are important when fully developed of little more than individual value. As regards the phylogenetic significance of the tritubercular molar, I of course agree with Dr. Rütimeyer's indication, having already expressed the same in various publications, but first in 1884.[1] Of this priority, Dr. Rütimeyer is probably not aware.

I must here correct two misquotations of my writings which have slipped into Dr. Rütimeyer's text, both on p. 12. First, that I have regarded diplarthrism of the astragalus as a primitive character. I have, on the contrary, always regarded it as a high specialization, and have so stated many times in print, and never otherwise. Second, that having placed Hyrax in the Taxeopoda on one page, changed my view on a subsequent page. (Tert. Vert. III, p. 382). This is also a misconception; reference to the page cited shows no such change, nor has any such change of opinion ever been made by me.

Dr. Rütimeyer refers to his early paper on the Odontographie der Hufthiere, published in Basel in 1863.[3] I must now confess my own shortcoming in not having long ago studied this important memoir. In this study of the structure of the molar teeth of the Ungulata Prof. Rütimeyer *anticipates by ten years the same results reached by Kowelevsky and myself in 1873.* For the first determination of these homologies *exclusive credit is due to Prof. Rütimeyer.* He divides the molar teeth of Mammalia into three categories, the simply conic "Homœodont;" the vertically plicate, "Elasmodont;" and the cross-crested by junction of four tubercles, the "Zygodont." To the homœodont I subsequently gave the name hoplodont, which name must be suppressed. So also with my term ptychodont, which must give way to the prior elasmodont. As to zygodont, I prefer to recognize two types of molar crown in this series instead of but one, viz.: a simply quadritubercular, and a specialization of it where the tubercles are connected together by crests. For the former I used Kowelevsky's term bunodont, and to the second I gave the name lophodont. I find the zygodont idea too comprehensive, and also too restricted as applying only to cross-crests, while longitudinal crests (as in Rhinoceros) are embraced in my idea and corresponding term of lophodont.

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[1] Transac. Amer. Philos. Society, p. 352, fig. 12.

[2] American Naturalist, 1883 (April), p. 407, and Proceedings American Philosophical Society, 1873-4, p. 324.

[3] Verhandl S. Naturforsch. Gesselsch Basel II, 1863, p. 558.

Prof. Rütimeyer also ascertained that the remaining internal cusp of the tritubercular superior molar is the anterior internal.

It is difficult to ascertain from Prof. Rütimeyer's memoir to what extent he translated his homological determinations into phylogenetic equivalents. His language allows us to suppose for instance that in Ungulata, bunodont molars are derivatives from lophodont types, and simple premolars from the complex; but it is not certain that he wishes us to regard him as holding such an opinion. The histories of the tritubercular and tuberculosectorial and triconodont molars and the resulting phylogenetic deductions, are not embraced in this memoir.—*E. D. Cope.*

GEOLOGICAL NEWS.—GENERAL.—Two recent works of M. A. Daubree, the one upon subterranean waters in the present epoch, and their composition from the point of view of the part they play in the earth's crust; the other upon the *rôle* of subterraneous waters in ancient epochs, are worthy of attention from all who are interested in rock-formation. A lengthy review of both will be found in the *Neues Jahrbuch für Mineralogie, Geologie, und Palæontologie*, II, Band, Zweites Heft., 1888.

Petermann's *Geographische Mitteilungen*, XXXIII., 1887, contains a geological map of Africa upon a small scale, accompanying an article by Dr. Gürich. The sketch is colored to show six formations, but a large portion of the continent is, as might be supposed, left uncolored. The crystalline rocks, including the Silurian clays, predominate on the southeastern, southwestern, Red Sea, and Guinea coast districts; the Palæozoic, which as colored includes the Dyas in the Atlas Mountains, but excludes that formation elsewhere, is prominent only in patches of the Sahara, and in South Africa; the Karroo-formation, which in the south includes Dyas and Trias, covers all South Africa save the portions occupied by the crystalline and palæozoic rocks, and reappears in large patches on the eastern and western coasts, as well as in the Niger region; the Cretaceous is most conspicuous in the north, where it occupies the greater part of the Barbary States west of Barca; and the Tertiary strata cover the entire lower Nile valley, and stretch along the Mediterranean west to the Gulf of Sydra. From the head of the eocene to Khartum cretaceous rocks are shown bordering the Nile. The principal mass of the younger eruptive rocks is in Abyssinia, where they are of early tertiary date.

The author gives the following summary. The African continent falls into three distinct geological regions: (1) The Atlas, which comprises a tolerably complete series of formations, that collectively have undergone similar disturbances to those that have taken place in the Alps; geologically, this region belongs to Europe. (2) The Desert region is distinguished by the horizontality of the Palæozoic strata and by great gaps below the chalk; the latter formations show a development corresponding to that of Syria and Arabia. (3) The South African region, which consists of a boss of crystalline mountains of enormous extent, covered with innumerable layers of horizontal sandstone, the age of which lies between that of the Carboniferous and that of the Jura. Analogous conditions occur in India. The marginal zone of later formations is also characteristic.

I. C. Russell contributes to the August issue of the *Geological Magazine* a summary of what is known of the geological history of the Jordan-Arabah depression, which offers so many points of resemblance to the Great Basin of North America that he ventures some suggestions and hypotheses.

DEVONIAN.—Numerous crinoids collected in the Lower Devonian strata of Bundenbach and Gemunden are described by Dr. O. Follman in the *Verh. d. nat. Jahrg.*, xxxiv. 5 Folge, IV. Bd., pp. 113–138. Seven new species are described and figured.

CRETACEOUS.—Nœtling distinguishes three groups of strata in the cretaceous of Syria and Palestine. The uppermost contains Gryphæas and Cephalopoda, but is without Nerinea and Rudista. The upper part consists of chalk with flints, the lower of bituminous shales and lime, and the group corresponds to the Senonian. The middle group corresponds to the upper Turonian, and contains numerous Rudista, Cephalopoda, and Nerinea, but no Trigonias or Cythereas; it consists of dazzling white thick limestones with alternating beds of gray clays, but contains no flints. The lowest group has many Trigonias, Cythereas, and Nerineas, but few Cephalopoda and Rudista; it consists of sandstones, clays, and arenaceous limestones, and is identified with the lower Turonian. The Syrian cretaceous is distinguished from that of Europe by the absence of Belemnites and Inocerami. The Trigonia sandstone of the lowest group has a European character, while the Senonian resembles that of Africa.

CÆNOZOIC.—According to M. Gaudry, the following are the heights of the largest fossil mammals that have yet been discovered:

(1) The *Dinotherium giganteum* from the upper miocene of Attica, the tibia of which, brought from Pikermi by M. Gaudry, measures 0.94m. in length, representing a height of 4.43m. at the shoulders, and 4.96m. at the top of the head. (2) The *Elephas antiquus*, found in the quaternary near Paris, height at the withers 3.95, and to the summit of the head 4.42m. (3) The *Elephas meridionalis* from the pliocene of Durfort, which is the largest entire mammalian skeleton (fossil) yet known, and is now at the Palæontological Museum in the Jardin des Plantes; its height at the shoulders is 3.77m., and it measures 4.42m. to the top of the head. (4) The *Mastodon americanus* from the quaternary of the United States measures 3.55m. to the top of the head. (5) The *Elephas primigenius*, or mammoth of the Siberian quaternary, is 3.42m. to the top of the head.

MINERALOGY AND PETROGRAPHY.[1]

Petrographical News.—In a late number of the *American Geologist*,[2] Messrs. Herrick, Clarke and Deming have a short article on some American norites and gabbros. Three rocks are described. The first is from Marshall Co., N. C., and is called olivine-norite. Its feldspathic constituent is labradorite, and its pyroxene is regarded as bronzite. The second—a porphyritic diorite, contains garnet and apatite. It is a facies of the norite. The Duluth gabbros are finally taken up and briefly described. In one phase of this rock the authors think they have found feldspar crystals, with a central core of labradorite, surrounded by a zone of orthoclase. Very little new is stated in regard to these rocks, except the view that the orthoclase-gabbros may be derived by the action of solutions (emanating from acid rocks) upon olivine-gabbro. The paper contains the statements of many important views, which, however, will not generally be accepted by petrographers unless substantiated by many more facts than the authors have been able to discover.—An instructive paper on some English tachylites is that by Mr. Cole in the *Quarterly Journal of the Geological Society*.[3] In it he describes a glassy basalt which exhibits all the stages in the transition from a glassy to the completely spherulitic forms so familiar among acid lavas. The spherulites are sometimes composed of an intergrowth of gray and brown fibres, which show the

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.
[2] June, 1888, p. 339.
[3] May, 1888, p. 300.